The Effect of Health Insurance Competition when Private Insurers Compete with a Public Option*

Abe Dunn†

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Abstract

Around 20 percent of Medicare enrollees choose to leave the public Medicare plan and purchase insurance from a private insurer through the Medicare Advantage (MA) program. Competition among MA insurers is studied using a flexible model of supply that exploits available structural demand estimates, but does not impose behavioral assumptions. I find that around 40 to 50 percent of the welfare in MA markets is generated by competition among rivals and similar results are found if one assumes Nash-Bertrand competition over premiums. However, the flexible model of competition reveals that insurers compete over multiple dimensions, including both premiums and benefits.

1 Introduction

Most health insurance offerings in the United States are owned and operated by private insurers.[1] Even the largest government run health insurance program, traditional Medicare, competes with a private alternative called Medicare Advantage (MA) that covers around 20 percent of the Medicare eligible population.[2] The strong reliance on the

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†Bureau of Economic Analysis; abe.dunn@bea.gov

[1] According to Health United States (2009), in 2007 about 61% of the U.S. population was enrolled in a private health insurance plan.

[2] Prior to 2003 the program was called Medicare+Choice.

private sector to supply health insurance is similar to most other sectors in the U.S. economy, but contrasts with other industrialized nations that rely more heavily on the government for health insurance. The relatively high cost of health care in the United States and the prevalence of privatized insurance markets has led many policy makers to question whether the lack of private insurer competition is to blame.[3] Criticism has also been directed at MA markets where a public option is available, but some still regard these markets to be highly concentrated.[4] Others argue that private insurers compete effectively and that government intervention crowds out benefits of competition among private insurers.[5] There has been considerable public debate over these issues, but relatively little is known about competition among private insurers in both the commercial and MA markets (See Deborah Haas-Wilson (2003)).

This article explores the effects of competition in the MA program. Although most Medicare beneficiaries are enrolled in traditional Medicare, many beneficiaries choose to leave the publicly administered health plan and select a private MA plan. MA plans are preferred by many beneficiaries because insurers are allowed to compete over premiums and customize insurance benefits that may be greater than those in traditional Medicare. This article address a number of questions related to competition in MA markets: How much do individuals benefit from competition among private insurers? What might be the effect of additional competition or less competition? Are there efficiencies from economies of scale? If so, how large are these efficiencies?

Measuring the effects of health insurance competition is a challenging task. Unlike many consumer goods that have relatively fixed characteristics and are sold at a particular price (e.g. cereal, beer, and cars), insurers compete by changing an entire range of benefits as well as the premium. Given the numerous strategic variables, insurers are able to respond to rivals in a number of different ways, complicating the analysis of the insurer's supply decisions and increasing the possibility of multiple equilibria or the non-existence of an equilibrium.[6] Moreover, it is unclear what assumption should be made regarding the type of competitive behavior (i.e. dynamic vs static; collusive vs

[3] Kaiser Family Foundation, "Health Care Spending in the United States and OECD Countries", January 2007

[4] "Washington Health Policy Week in Review Medicare Advantage Market Competitive? Not So Much, Study Concludes" by John Reichard, June 25, 2010, The Commonwealth Fund

[5] "How to Stop Socialized Health Care: Five Arguments Repulicans Must Make," Karl Rove, *Wall Street Journal*, Opinion, June 2009. "In Defense of Paul Ryan's Medicare Plan", Shawn Tully, *Fortune*, April 7, 2011.

[6] Einav et al. (2010) note several challenges in studying the effects of competition in insurance markets, including the possibility that the convexity properties necessary to justify an analysis based on first-order conditions may not hold. In addition, there may not exist a pure strategy equilibrium (See Rothchild and Stiglitz (1976) and Wilson (1977)).

competitive; simultaneous pricing vs Stackelberg; Cournot vs Bertrand pricing).[7] Competition with a public option and the regulatory oversight of Medicare also raise concerns of whether private insurers can compete effectively in MA markets. The potential power of the regulator is stated clearly in the Federal Register (2005), "The Congress ... did not leave the determination of rates entirely to market forces. We are required to determine that the reasonable and equitable test is met and we are given negotiating authority to assure this result."

A common approach to modeling competition is to estimate a structural model of supply where researchers usually assume the pricing behavior of firms to analyze alternative competitive scenarios (e.g. Berry, Levinsohn, and Pakes (1995), Nevo (2000, 2001), and Petrin (2002)). However, given the potential multitude of insurer strategies and the public concern that insurers do not behave competitively (or they behave less competitively than in other markets), an analysis assuming the behavior of insurers may not be convincing. An alternative to structurally modeling competition when the behavior of firms is uncertain is to apply reduced form techniques. In reduced form studies price is typically regressed on a measure of industry concentration and control variables to analyze the effects of competition. Numerous papers have used this approach to analyze competition across a variety of industries including movie theaters (e.g. Davis (2005, 2006)), airlines (e.g. Gerardi and Shapiro (2010)), hospitals (e.g. Dafny (2009)), hotels (e.g. Mazzeo (2003)), and office supplies (e.g. Baker (1999)). As noted in each of these papers, the concentration measure is likely endogenous, leaving the researcher to control for this potential bias.

This article takes a unique approach to modeling competition in the MA insurance market. This approach uses structural demand estimates to separate out the endogenous component of demand (i.e. the premium and benefit structure) from the exogenous component that captures the value of the product characteristics to consumers. There are three primary benefits from applying this methodology. First, unlike structural models that specify a strict relationship between the estimated demand parameters and the prices set by firms, the model presented here allows for greater flexibility without imposing strong behavioral assumptions. Secondly, in contrast to reduced form models, this approach controls for product characteristics that are not observed by the researcher, where potentially important unobserved characteristics for health insurance are the quality of the network and the reputation of the insurer.[8] Here the demand estimates are exploited to incorporate both observed product characteristics and

[7] In addition to insurers playing a variety of different strategies, there may be different equilibrium strategies applied across different markets. For instance, insurers may be playing a collusive dynamic game in one market, but a Nash-Bertrand equilibrium in another.

[8] There are a number of factors that impact demand that may be challenging to quantify in insurance markets. Sorensen (2006) finds evidence that individuals learn about health plan quality from others. Ho (2006) shows the quality of the hospital network may have an

unobserved factors derived from the revealed preferences of consumers. Third, researchers usually evaluate the effect of competition on a single strategic variable, such as the effect of competition on the premium. However, much of the theoretical literature treats the premium and the entire benefit structure as being endogenously set by insurers (e.g. Rothschild and Stiglitz (1976) and Wilson (1977)). The flexible supply model estimated in this article allows for competitors to respond to rivals using multiple strategic variables.

More broadly, this approach may be applied to measure competition in differentiated product markets where rivals compete along several dimensions, without imposing rigid assumptions on supply behavior. Both the flexible supply model and structural models of competition answer similar questions regarding the effects of competition using alternative assumptions and may be viewed as complementary. Similar to structural models of competition, the model presented here offers a mapping of ownership structure and demand parameters to market price, but the relationship to price is guided by the empirical specification, rather than imposing a relationship based on an assumed theory. The focus of the analysis is on the flexible model of competition, but this article also presents results from a structural Nash-Bertrand pricing game, which offers an important benchmark for comparison.

The effects of competition are shown to be economically significant whether the effects are evaluated using the flexible supply model or a structural approach that imposes Nash-Bertrand pricing over premiums. Both models suggests that competition accounts for around 40 to 50 percent of the consumer surplus in the MA program. The similarity in the measured competitive impact across the flexible supply model and structural estimates suggest that Nash-Bertrand pricing offers a reasonable approximation to the observed competitive behavior. However, the estimates from the flexible model reveal that insurers respond to competition by both reducing premiums and increasing benefits. In addition to an analysis of competitive effects, this article presents evidence of economies of scale using both the alternative methodology and the structural analysis. The structural estimates suggest that doubling enrollment in a market reduces marginal cost by about $234 per enrollee per year. Although the economy of scale efficiencies are substantial, the competitive harm from hypothetical mergers tend to be much larger than the economy of scale benefits, highlighting the practical importance of antitrust enforcement in regulated MA markets.

The remainder of this article includes the following sections: the second section reviews the related literature; the third section provides a description of the MA markets; the fourth section presents both the model of demand

important impact on the demand for insurance products. Even when one attempts to construct accurate measures of insurance product quality, these measures determine only a small fraction of consumer plan choices (See Chernew et al. (2007)) suggesting that there may be key unobserved factors influencing plan choice.

and supply; and the fifth section describes the data. The last three sections present the results, conduct market analysis, and the final section concludes.

2 Literature Review

Several studies have taken a reduced form approach to study the effects of competition in health insurance markets. Wholey et al. (1995) analyze competition in commercial insurance markets using cross-sectional information on HMO premiums and market structure for the years 1988 to 1991 and find evidence of competitive effects across markets. More recently, Dafny et al. (2010) use unique micro data for large employers and apply panel data and instrumental variable techniques where their instruments exploit the changes in ownership structure due to an observed merger. They find evidence of competitive effects that implies a real premium increase of 2 percentage points due to an increase in concentration from 1998 to 2006. These reduced form studies offer some evidence that competition leads to lower premiums, but a key challenge is to address the endogeneity of the market structure variable and to include sufficient controls to rule out alternative causes for the observed relationship between market structure and premiums.[9] Moreover, these papers do not consider the efficiency effects from consolidation.

Another branch of the literature studies competition in health insurance markets by estimating a structural supply model. Town and Liu (2003), Dunn (2010), and Lustig (2010) use these techniques to evaluate the profitability of insurers in the MA program and Town (2001) takes this approach to analyze issues of competition in commercial HMO markets in California. The supply models in these papers assume insurers compete by playing Nash-Bertrand game over premiums.[10] Both Town and Liu (2003) and Town (2001) focus on the effects of competition and find evidence consistent with competition leading to greater consumer surplus. An advantage of the structural approach is that researchers can make precise predictions on premiums as the ownership structure changes. However, imposing assumptions on firm behavior may be overly restrictive and lead to bias estimates. Although it is possible to identify behavioral parameters in differentiated product industries, the data requirements necessary for doing this are practically impossible to satisfy (Nevo (1998)). The challenges with this approach are even greater in health

[9] For instance, when using a merger of insurers as an instrument, one must be careful that higher prices post-merger are due to a reduction in competition, and not an improvement in product quality from the merging firms (e.g. improvements in quality from combining provider networks).

[10] While Lustig (2010) considers that firms optimize over both benefits and premiums, his counterfactual analysis of competition focuses on Nash-Bertrand strategies over premiums.

insurance markets where competition is occuring over multiple dimensions.

All of the above papers primarily focus on the effect of competition on premiums, even though competition is likely to affect both premiums and benefits. The potential problems with focusing on only a single competitive variable and imposing assumptions on firm conduct are explored in the work by Peters (2006). Examining pricing behavior pre- and post-merger in airline markets, Peters finds that deviations from the assumed model of firm conduct play an important role in accounting for the differences between price changes predicted by a structural supply model and the observed changes. Applying a merger simulation he finds large differences between simulated and actual post-merger prices. As a result of this finding, he advocates for researchers to use more flexible models of firm conduct when analyzing the potential effects of mergers. This paper follows this suggestion by modeling the effects of competition without imposing strong behavioral assumptions and allowing firms to respond competitively by adjusting a variety of strategic variables.[11]

The flexible supply presented in this paper is most closely related to the work of Goolsbee and Petrin (2004) who analyze the benefits of competition between two competitors, cable TV and direct broadcast satellites (DBS). To analyze competition they first estimate a structural demand model that captures the relative value of these products across geographic markets. Next, their estimates are incorporated into a supply model, which consists of a regression of price on the consumer's value for the characteristics of the product and the value of the rival product characteristics, as derived from the demand estimates. Using this model, they find that cable prices fall significantly in response to the entry of DBS and the price reduction is greater when the quality of the DBS in the area is higher. I introduce an alternative model of supply that builds on their basic methodology. Unlike the Goolsbee and Petrin (2004) model that includes only a single rival, the flexible supply model proposed here applies to markets with many competitors, many products, and multiple strategic variables, which is critical for making this approach more broadly applicable. In addition, I incorporate panel data methods to control for unobserved factors that impact the price setting decision for a plan that are invariant over time.

Both the flexible model of competition and structural supply analysis presented in this paper rely on differentiated product demand estimates obtained from Dunn (2010) that considers premiums and the entire package of drug and medical benefits as strategic variables set by insurers. The insurer's incentive to strategically set benefits is especially

[11] In this way, this paper relates to a small number of empirical studies that treat price and product characteristics as endogenous, including Mazzeo (2002), Seim (2006), and Richard (2003).

important in MA markets where about 20 percent of all premiums are zero, highlighting the importance of competition along other dimensions. Dunn (2010) measures the value of benefits in by applying a unique measure of coverage that is the expected out-of-pocket cost (OOPC) for drug and medical services for a typical Medicare beneficiary. The OOPC measure includes nearly all health services used by beneficiaries including cost of specialists, inpatient hospital visits, outpatient hospital visits, prosthetics and orthotics, renal dialysis, primary care physicians visits, and numerous other services. That paper found that drug and medical benefits, as measured by the OOPC variables, accounted for a large fraction of consumer surplus in the MA program, and that observed variation in benefits across plans had a greater impact on consumer surplus than the variation in the premium. This article extends this earlier work by showing how the variation in benefits and premiums are affected by changes in the competitive environment.

3 A Brief Description of Competition in Medicare Advantage Insurance Markets

Medicare is a government insurance program that covers individuals that are either over 65, have a disability, or have end-stage renal disease. MA insurers are regulated by the Center for Medicaid and Medicare Services (CMS). In exchange for providing health insurance coverage, the government pays MA insurers for each Medicare beneficiary that enrolls in an MA plan using a rate set at the county level. The MA market is regulated by CMS, but private insurers are able to freely choose whether to enter and compete in a county market. Consequently there is a great variety of market structures. Table 1 shows characteristics of MA markets by the number of competitors in each market. The left hand column shows the number of competitors and each row provides average market characteristics. For instance, the average county with a single competitor has 1,371 enrollees and the number of eligible individuals is 17,796. As one might expect when firms are free to enter or exit counties, those markets with a greater number of insurers tend to be larger, as measured by the Medicare eligible population. In addition, markets with a larger number of insurers have higher MA rates (the third column), which is the amount that CMS pays private insurers for each enrollee. The next three variables summarize the generosity of benefits including the premium on the plan, the average OOPC for medical services (i.e. the predicted amount a person will spend for selecting a plan), and the average amount of savings on OOPC for drugs. Note that for the OOPC for prescriptions drugs a more negative amount represents savings to beneficiaries from additional benefits relative to traditional medicare. The summation of the premium and benefit measures is shown in the Total OOPC column. Table 1 shows that those counties with a larger number of insurers tend to have lower Total OOPC. Although this offers descriptive evidence of competition, there are several possible reasons for this observed relationship. The model presented in this article attempts to isolate the effects of competition on premiums and benefits.

[TABLE 1]

The basic structure of MA markets has been around for over three decades, but the Medicare Modernization Act of 2003 (MMA) introduced several changes in the program. One of the more important changes was a 10.4 percent increase in the rates paid to MA insurers in 2004 that was intended to promote participation in MA plans.[12] This increase in rates led insurers to enter a greater number of markets and has also caused a large expansion in enrollment over the period of study from 2004 to 2007. These changes produce variation in both enrollment and competition over time and across markets that is used to identify demand and supply estimates presented in this article.[13]

4 Model

This section presents the model of competition. The data used to estimate the model, discussed in detail later in this article, includes aggregate enrollment information for each plan in each county along with product characteristics of each plan (e.g. premiums, OOPC for prescription drugs, OOPC for medical services, and other variables). Before presenting the supply model, I briefly present the specification of the demand model taken from Dunn (2010).

[12] See Kaiser Family Foundation, (2004), Medicare Advantage Fact Sheet.

[13] Some other changes of the MMA include the introduction of Regional Preferred Provider Organization plans that were first offered in 2006, changing the name of the program from "Medicare+Choice" to Medicare Advantage, and implemented a bidding system for MA insurers. Prior to 2006 Medicare reimbursed participating HMOs a fixed amount per enrollee. In 2006 the payments incorporated a bidding mechanism that allows payments from the government to MA insurers to partly depend on the amount that insurers bid relative to a benchmark level. To be more precise, the bidding system involves insurers submitting bids for offering benefits that cover part A and B of traditional Medicare. If the bid is above the benchmark the cost is passed on to enrollees in the form of an additional premium. If the insurer's bid is below the benchmark, 75 percent of the difference is provided to enrollees in the form of greater benefits, while the remaining 25 percent of that difference is retained by the government. Although the system has added greater flexibility in how rates are paid by the government to insurers, the basic incentives of insurers to compete by adjusting benefits has not changed.

4.1 Demand

To estimate the impact of premiums and OOPC on demand I first specify a demand model for MA plans. Each Medicare enrollee makes a discrete choice of which option brings the greatest utility among the MA options available and an outside alternative. Following other studies in the MA literature, demand is estimated using a multinomial logit demand model. The basic approach follows Berry (1994) by specifying a discrete-choice model of enrollee demand that uses market-level data and may be estimated using a linear regression. The characteristics of the insurance plan affect the average desirability, but enrollees have distinct taste for the different insurance offerings. MA plans are grouped in a nest, which allows for substitution among MA plans to differ from substitution between MA plans and the outside alternative.

The utility function of Medicare beneficiary i purchasing plan j in market m at time t is:

$$\begin{aligned} u_{ijmt} &= \delta_{jmt} + \varsigma_{iGroup}(\sigma) + (1-\sigma)\varepsilon_{ijmt} \qquad (1) \\ &= -\alpha p_{jmt} - \beta_1 OOPC\ Drugs_{jmt} - \beta_2 OOPC\ Medical_{jmt} \\ &\quad +\beta_3 X_{jmt} + \xi_{jmt} + \varsigma_{iGroup}(\sigma) + (1-\sigma)\varepsilon_{ijmt} \end{aligned}$$

The indirect utility u_{ijmt} is a function of the mean utility for the product, δ_{jmt}, and an idiosyncratic component unique to each individual, $\varsigma_{iGroup}(\sigma) + (1-\sigma)\varepsilon_{ijmt}$. The mean utility is a function of the premium charged, p_{jmt}; the expected out-of-pocket cost for prescription drugs, $OOPC\ Drugs_{jmt}$; and the expected out-of-pocket cost for medical services, $OOPC\ Medical_{jmt}$. The OOPC variables enter the model linearly, and it is expected that lower OOPC lead to higher utility.

The specification also includes other observable benefit and plan characteristics that enter the vector X_{jmt}. The average value of the unobservable product characteristics is ξ_{jmt}. The unobserved characteristics may include factors such as reputation, unique qualities of the provider network, or other attributes not contained in the available data. Differences across beneficiaries and their preferences for plans in the MA group and the non-MA group are captured by $\varsigma_{iGroup}(\sigma)$ which depends on σ. The parameter σ takes on a value between 0 and 1 with values close to 0 indicating substitution patterns do not differ across the nests and a value closer to 1 indicates that the correlation within the nest is high. The term ε_{ijmt} is the idiosyncratic error term of the beneficiary that is distributed i.i.d. Type I Extreme Value.

The outside good includes non-MA options such as traditional Medicare or a combination of traditional Medicare and Medigap supplementary plans.[14] Medicaid may be an alternative outside option for some low-income beneficiaries and in 2007 the outside good may also include a combination of traditional Medicare and Medicare Part D. The utility of the outside alternative u_{i0mt} is normalized to zero.

The model is well suited for the analysis of MA markets. It is a structural demand model that corrects for changes in the choice set caused by entry and exit, which is important given the rapid expansion of MA insurance over the period studied. The model also captures substitution among MA plans as well as substitution between MA plans and traditional Medicare. The parameters of the structural model are used to measure the effects of the premium and OOPC on demand; and are also used to estimate consumer surplus. An important feature of the demand estimates is that there is no supply restriction on firm behavior, which is critical for the flexible supply model that does not impose behavioral assumptions on insurers.[15]

The parameters of the demand model are estimated using the following linear equation:

$$\begin{aligned} \ln(s_{jmt}) - \ln(s_{0mt}) &= -\alpha p_{jmt} - \beta_1 OOPC\ Drugs_{jmt} - \beta_2 OOPC\ Medical_{jmt} \\ &\quad + \beta_3 X_{jmt} + \sigma \ln(s_{j|MA}) + \xi_{jmt} \end{aligned}$$

where the share of plan j is denoted s_{jmt} and the market share of the outside good is s_{0mt}. The share $s_{j|MA}$ is the share of plan j conditional on choosing a MA plan.

The model is estimated using an instrumental variable regression model that addresses the endogeneity of p_{jmt}, $OOPC\ Drugs_{jmt}$, $OOPC\ Medical_{jmt}$, and $\ln(s_{j|MA})$. Additional details regarding the specification of the demand model are contained in the appendix to this paper and in Dunn (2010). In particular, the appendix discusses sample selection, instruments used in the estimation of demand, consumer heterogeneity, and the role of county and state-time fixed effects used to control for differences in the outside options across markets and over time.

[14] Medigap plans are a supplement to traditional Medicare that provides additional coverage, whereas MA plans are actually a replacement for traditional Medicare. Medigap plans are typically more expensive than MA plans and are purchased disproportionately by individuals with higher incomes (Atherly and Thorpe (2005)).

[15] This contrasts with a Baysien framework that must fully specify the supply-side equilibrium (See Berry (2003) for a more complete discussion).

4.2 Insurer Profits and the Benchmark Structural Supply Model

This section describes the profit function of insurers and the structural supply model that will be used as a benchmark for comparison to the flexible supply model. The profit of each insurer in each county will depend on its set of product offerings, the revenue on the products, and the overall cost. The profit in county m for insurer i offering the set of plans J_{it} at time t is given by the equation:

$$\pi_{imt} = \sum_{j \in J_{it}} (MArate_{mt} + p_{jmt} - AVC_{jmt}) s_{jmt} M_{mt} - F_{jmt}$$

In the above equation, $MArate_{mt}$, is the amount that Medicare reimburses insurers in market m in year t.[16] The average variable cost of the insurer is, AVC_{jmt}, but there may also be economies of scale, so that marginal cost and average variable costs may depend on the number of enrollees. The fixed cost associated with offering a plan is F_{jmt}.

The benchmark model assumes that insurers play a static Nash-Bertrand game. The first order condition with respect to the premium, p_{jmt}, for plan j is:

$$s_{jmt} + \sum_{k \in J_{it}} (MArate_{mt} + p_{kmt} - mc_{kmt}) \left(\frac{ds_{kmt}}{dp_{jmt}} \right) = 0 \tag{2}$$

Using the above demand estimates and first order conditions from the maximization problem, one may derive the marginal cost function of each insurer. Following the notation from Nevo (2001), the equation above may be transformed into matrix notation so that $s + \Omega(MArate + p - mc) = 0$ where p and s are vectors and Ω is a matrix of own- and cross- price share derivatives.[17] Next, the vector of marginal costs is derived, $mc = (MArate_{mt} + p) - \Omega^{-1} s$. Using estimates of marginal cost along with the first order conditions, counterfactual simulations may be performed by solving for the equilibrium outcomes under alternative ownership structures.

[16] I do not have information on individual plan bids. Even though I do not have this information, the $MArate_{mt}$ in 2007 is adjusted to reflect the fact that firms, on average, receive payments from the government below the benchmark level. This adjustment is small, since the amount of the benchmark rate returned to CMS was about 3.5 percent (See MedPac (2007) Update on Private Plans). The profit function in 2007 should be viewed as an approximation to the actual profit function of insurers.

[17] More precisely, let Ω^*_{jr} be an indicator function for whether an insurer owns both products j and r. Also suppose there are N products in the market. Then the value of $\Omega = \begin{pmatrix} \frac{ds_{1mt}}{dp_{1mt}} \cdot \Omega^*_{11} & \ldots & \frac{ds_{Nmt}}{dp_{1mt}} \cdot \Omega^*_{N1} \\ \ldots & \ldots & \ldots \\ \frac{ds_{1mt}}{dp_{Nmt}} \cdot \Omega^*_{1N} & \ldots & \frac{ds_{Nmt}}{dp_{Nmt}} \cdot \Omega^*_{NN} \end{pmatrix}$.

In addition to obtaining estimates of marginal cost, this article also estimates a marginal cost function that is used to measure economies of scale. Using the prediction of marginal cost at the equilibrium price, the marginal cost function is estimated as a linear function of observable variables and the log of the total enrollment for the insurer within the county. If economies of scale are present, an increase in the number of enrollees will reduce marginal cost.

4.3 Flexible Supply Model

There is some unique notation in the description of the flexible supply model. Similar to the structural approach above, the flexible supply model uses the demand estimates that contain information on the beneficiary's valuation of both the observed and unobserved product characteristics. Recall that the mean utility of a particular plan j in market m at time t is

$$\begin{aligned}\delta_{jmt} &= -\alpha p_{jmt} - \beta_1 OOPC\ Drugs_{jmt} - \beta_2 OOPC\ Medical_{jmt} \\ &\quad +\beta_3 X_{jmt} + \xi_{jmt}\end{aligned}$$

The mean utility, δ_{jmt}, of a plan may be decomposed into different components. One component consists of factors that are endogenously determined by insurers, $-\alpha p_{jmt} - \beta_1 OOPC\ Drugs_{jmt} - \beta_2 OOPC\ Medical_{jmt}$. Using the estimated marginal utility of income, α, this term is transformed into a dollar figure representing the *full price* of the plan to Medicare beneficiaries, $P^*_{jmt} = \frac{-\alpha p_{jmt} - \beta_1 OOPC\ Drugs_{jmt} - \beta_2 OOPC\ Medical_{jmt}}{-\alpha}$. That is, the full price is a single value for each plan, market and time period that represents the total dollar value of the premium, drug benefits, and medical benefits, as implied by the structural demand estimates. In other words, full price includes the premium and OOPC estimates weighted by their impact on consumer surplus. Unlike the premium and benefit package that may be easily changed by the insurer, the remaining component of mean utility consists of factors that are less influenced by the insurer in the short run, $\delta^*_{jmt} = \beta_3 X_{jmt} + \xi_{jmt}$, which I will refer to as the *quality* of the plan.[18]

[18] This is also an implicit assumption in most static structural models of supply. If δ^*_{jmt} is affected by the competitive environment in the short run, then both the demand estimates and the supply estimates are likely to be bias.

Some factors that may change strategically are included in δ^*_{jmt}, such as whether the plan has a deductible. The results remain very similar when these product characteristics are left out of δ^*_{jmt} in both the demand and supply analysis.

The conceptual framework of the flexible supply model is fairly straightforward. The full price is likely affected by many factors, but the quality of the products in the market and the ownership structure may be particularly important. Intuitively, an insurer will price higher if the quality of the insurer's own product is higher. However, the product quality of competing insurers may also influence price, since these products represent the outside alternative for consumers. Thus, profit maximizing insurers may best respond to the insurance offerings of rivals. In a competitive environment where price is a strategic complement, one should expect prices to be lower in markets where rival product quality is higher. Although this is the expected empirical relationship, the flexible supply model imposes no theoretical constraints.

Before presenting the full model, I start by describing a flexible model with just two rival products, similar to the Goolsbee and Petrin (2004) analysis. The supply function for insurer 1 with a single rival, insurer 2, is given by:

$$P^*_{1mt} = \tau\delta^*_{2mt} + \theta_1\delta^*_{1mt} + \theta_2 W_{1mt} + \upsilon_{1mt}$$

The parameter, τ, measures the impact of rival product quality, δ^*_{2mt}, on the full price offered by insurer 1, and this is the key parameter used to estimate the effects of competition. The remainder of the equation includes control variables constructed from the quality of insurer 1's product, δ^*_{1mt}, and additional observable information, W_{1mt}. These variables control for both demand and cost factors that may affect prices.[19]

4.3.1 Full Specification

The above model with just two insurers contains the basic components of the supply model, but in MA markets there may be multiple differentiated rivals and insurers may offer several products, which is likely to affect pricing decisions. Although one could adjust the above model to flexibly include many quality measures, this may complicate the interpretation of the estimates and it may be challenging to precisely identify a large number of parameters. To simplify the analysis, two measures of competition are proposed that account for both rival product quality and the overall concentration in the market:

1. *Rival product quality*

[19] In their analysis of competition between cable and DBS, Goolsbee and Petrin find a significant and negative response from increases in rival product quality, δ^*_{2mt}. They also find that controlling for the unobserved product characteristic, ξ_{jmt}, contained in the quality measure, δ^*_{1mt}, is important.

The amount of competition in the market due to rival quality is similar to the measure used in the two firm example, but here I aggregate over all rival product quality. The aggregate rival product quality is measured as:

$$RU_{I,mt} = \log(\sum_{j \in Rival} \exp(\delta^*_{jmt}))$$

This functional form approximates the total utility from rival products. However, all rival prices are normalized to zero, $P^*_{mt} = 0$, which removes the endogenous price and OOPC variables from the right hand side of the estimation equation.[20] Inclusion of this competition term is a parsimonious way of incorporating rival quality from multiple insurance products. In addition, this measure of competition is likely to be important in a differentiated product setting where rival product quality is a key determinant of the plan choice.

2. *Concentration within the market*

For a given level of rival quality, the intensity of competition within the MA market may depend on the concentration in product ownership that affects how insurers best respond to each other.[21] Similar to $RU_{I,mt}$, the concentration measure depends only on the quality of the products and does not depend on the price variable, P^*_{mt}. Using the usual logit functional form, the "quality" share is computed as:

$$s^*_{jmt} = \frac{\exp(\delta^*_{jmt})}{\sum_{k \in M} \exp(\delta^*_{kmt})}$$

Next each insurer's total quality share is calculated by adding the shares over all of their products. Specifically, an insurer that owns the set of products, I, has a quality share that is calculated as $s^*_{I,mt} = \sum_{j \in I} s^*_{jmt}$. Using these shares, a measure of market concentration is constructed, which I will refer to as the *product concentration* measure. The product concentration for market, m, is calculated as:

$$PCONC_{mt} = \sum_{I \in M} (s^*_{I,mt})^2$$

This concentration measure is comparable to the Herfindahl-Hirschman Index (HHI), but it is distinct because the endogenous variable, P^*_{mt}, has been removed prior to its construction.

In addition to the competition measures, it may be important to control for both the observed and unobserved characteristics for the full set of products offered by an insurer. For example, in setting P^*_{jmt} a multiproduct insurer

[20] This functional form is the consumer surplus based on the logit model where the nesting parameter σ is set to zero.

[21] All else equal, the more insurers best responding to each other will lead to lower prices.

may be concerned with the cannibalizing sales of other products. Therefore, in addition to including an insurer's own product quality, δ^*_{jmt}, researchers should include the total quality from all products offered by that insurer. Following the approach for specifying total rival quality, let the total product quality for insurer I be $\delta^*_{I,mt} = \log(\sum_{j\in I}\exp(\delta^*_{jmt}))$.

The model also includes either county fixed effects or product fixed effects. The county fixed effects account for all factors affecting pricing in a county that are invariant over time and common across products, and the product fixed effects control for unobserved cost information or other factors specific to a product that may be invariant over time.[22] Fixed effects have proven to be useful in numerous studies of competition.[23] However, one disadvantage of including product fixed effects is that observations where a product is only observed for a single period are excluded from the analysis. Therefore, this article will estimate models both with and without product fixed effects.

The full model estimated in this paper includes the measure of the utility from rival products, $RU_{I,mt}$, the measure of market concentration, $PCONC_{mt}$, the total utility from an insurer's product offerings, $\delta^*_{I,mt}$, and the county fixed effects (or product fixed effects), υ_{jm}. The full specification is shown in the equation below:

$$P^*_{jmt} = \tau_1 RU_{I,mt} + \tau_2 PCONC_{mt} + \theta_1\delta^*_{jmt} + \theta_2\delta^*_{I,mt} + \theta_3 W_{jmt} + \upsilon_{jm} + \Delta\upsilon_{jmt} \tag{3}$$

Although 3 shows a linear specification, when estimating this model I include nonlinear functions of both δ^*_{jmt} and $\delta^*_{I,mt}$ to allow for greater flexibility in how prices change in response to movements in product quality.

The flexible supply model maps the demand parameters and ownership structure into a predicted price for each product. After the model is estimated, the competitive effects from changes in market structure may be simulated by reallocating product qualities δ^*_{jmt} across insurers. For example, a merger with a rival that owns a single product of quality δ^*_{rmt} would reduce $RU_{I,mt}$, increase $PCONC_{mt}$, and increase $\delta^*_{I,mt}$ for the acquiring firm by an amount proportional to δ^*_{rmt}.

Discussion. Although the flexible supply model is different from the Nash-Bertrand pricing model, the two approaches are related. The assumption of Nash-Bertrand pricing is a theory that provides a mapping from the model's primitives to the predicted prices. In other words, if we let Nash-Bertrand pricing be represented by a

[22] Other factors that may affect pricing and are invariant over time may include unobserved demand factors that are not precisely captured by the demand model. There may also be behavior that is invariant over time, so that the fixed effects account for the type of equilibria that is selected in the market.

[23] This includes Davis (2005, 2006), Gerardi and Shapiro (2010), and Baker (1999)

function f_{NB}, then the price prediction is a nonlinear function of the quality of products and the ownership structure, $P^*_{jmt} = f_{NB}(\delta^*_{mt},\ Ownership)$.[24] Similarly, the flexible supply model offers a mapping of ownership structure and quality measures to market price, but the relationship to price is guided by the above empirical specification, rather than imposing a relationship based on an assumed theory.

The flexible supply model has a number of advantages, but it is important to note some key limitations. First, similar to a static structural model of competition, the measure of quality, δ^*_{jmt}, is considered fixed prior to the firms decision to set prices. Therefore, one must assume that premiums and benefits are more easily adjusted than other product characteristics. This assumptions seems reasonable because insurers can adjust premiums and benefits at no cost, but it is more difficult to change the reputation of a plan, the quality of the plan, and the quality of the network (e.g. contracts with hospitals are often for multiple years). A second limitation is that the cost and profit function of insurers are not recovered, which contrasts with the structural approach where costs and profits are fully specified. Therefore, researchers interested in precisely identifying an insurer's underlying cost and profit functions should apply a more structural approach.[25] Third, the model requires the researcher to specify a functional form, which is a limitation because the competitive predictions may depend on the chosen specification.[26] Fourth, it is unclear whether the "average" effect captured by the model is ever played. As an example, suppose that insurers alternate between collusive and non-collusive pricing across markets, the flexible supply model will only capture an average effect. Although this is a limitation, this "average" effect may more accurately capture welfare effects than a model that imposes incorrect theoretical assumptions.

The flexible supply model also relates to some models of competition and bargaining in the hospital industry, such as the work by Town and Vistnes (2001) and Capps, Dranove and Satterthwaite (2003). These studies of bargaining regress the price (or profit) from a hospital admission on a consumer's expected willingness to pay for a hospital admission (similar to the $\delta^*_{I,mt}$ measure). The model presented in this article is related to these bargaining models because they are both "reduced form" models of supply that do not fully specify the strategies of firms, but exploit structural demand estimates to analyze competition. The novelty of the flexible supply model is that it also includes measures of rival product quality and concentration that affect the pricing strategies of firms. These

[24] Although estimates of marginal cost are also used when conducting simulations, these costs are typically derived from the behavioral assumption of the firm.

[25] In addition, it is challenging to make out-of-sample predictions using this type of analysis.

[26] It is also important to note that the specification may need to be adjusted to reflect the demand model that is estimated. For instance, if random coefficients are included in the model, one may attempt to include the rival utility of the closest substitutes.

additional measures are potentially important in either a bargaining setting or posted-price market, such as MA insurance, because they affect the outside option of purchasers.

Economies of Scale. The above model does not account for changes in price that may occur due to economies of scale. In particular, a researcher may be interested in capturing how economies of scale affect the full price in the market as enrollment changes. This is particularly important when analyzing mergers, where researchers are interested in both the effects of competition, as well as the efficiencies that arise from consolidation. As an alternative to specification 3, a model is estimated where the full price is also a function of $\log(enrollment_{I,mt})$ where $enrollment_{I,mt}$ is total enrollment for insurer I in the county. Enrollment is clearly endogenous in this specification, so to accurately measure the effects from economies of scale, an instrumental variable (IV) technique is applied. The IV analysis requires instruments that are correlated with an insurer's enrollment in the market, but uncorrelated with the cost of the insurer. I use the number of eligible individuals in the county and interactions of the number of eligible individuals with the number of years the insurer has been in the county.[27]

5 Data

There are three primary data sets used in this article: OOPC data produced from the out-of-pocket cost calculator, plan characteristics from the plan compare database, and enrollment data from the State-County-Plan (SCP) files.

The OOPC data includes an estimate of the amount an enrollee might expect to pay out-of-pocket for a month for choosing a specific plan. The data are available to the public through the CMS website and provides a method of comparing the relative amounts of coverage for various plans. The expected out-of-pocket estimate is helpful to Medicare beneficiaries because plans often have a multitude of benefits, so this figure is a useful summary indicator of the overall level of coverage. The reported estimate is specific to an individual's age and health condition. For instance, in 2004 the expected OOPC for a man aged 73 that self-reports his health status as poor and selects the insurance plan in Las Vegas, Nevada called "Spectrum HMO" has an estimated monthly out-of-pocket cost of $529.

[27] The interaction of the number of eligible individuals and the insurer's age is included to capture the fraction of the eligible population likely to go to the incumbent insurer, due to reputation effects. One might be concerned that the age of the insurer is also correlated with the marginal cost of the insurer. To control for this potential issue, the inclusion of the insurer's age variable (without an interaction with the eligible population) is directly included in the pricing regression model.

Although this paper analyzes whether economies of scale are present, it does not examine the mechanism of how economies of scale are achieved. For instance, I cannot tell whether the savings is achieved through volume discounts or another mechanism.

The OOPC estimates are constructed by using a sample of more than 10,000 individuals from the Medicare Current Beneficiaries Survey (MCBS).[28] CMS calculates medical services used by individuals in the survey, to determine how much each individual would pay out-of-pocket for each plan, holding the health services used constant for each individual in the sample. By fixing health care consumption for each individual, the contribution of each service to the expected OOPC is weighed in proportion to the amount Medicare beneficiaries actually use. In addition, fixing health care consumption allows for a fair comparison of OOPC across plans. The health services covered in the calculation include those covered by traditional Medicare, but it also considers services not covered by traditional Medicare, such as, drugs, vision and dental. In fact, in calculating the OOPC estimate, nearly all health services used by beneficiaries are included in the analysis, such as the cost of specialists, inpatient hospital visits, outpatient hospital visits, prosthetics and orthotics, renal dialysis, primary care physician visits, and numerous other services.[29] The wide range of services covered by the OOPC variable makes it a useful and meaningful index of the level of coverage.[30]

The OOPC data used here distinguishes between OOPC for different services, such as prescription drugs or other medical services. In analyzing the effects of OOPC on demand, I view the drug coverage as distinct from other medical services for several reasons. First, historically, traditional Medicare has not provided drug coverage, so individuals may view the choice of drug coverage as distinct. Second, for prescription drugs enrollees can switch to cheaper, generic alternatives or use pill-splitting to save money, so separating out the OOPC expenditures for prescription drugs considers that beneficiaries may be able to shift drug expenditures more easily than other medical expenses. Third, drug purchases are more likely to involve stable payments relative to other medical services, so insurance coverage for prescription drugs may be less valuable than insurance coverage for services that are costly and involve greater uncertainty. For example, estimates from the 2006 Medical Expenditure Panel Survey report that around 91 percent of individuals over the age of 65 used prescription drugs and for those with expenditures, the mean

[28] The MCBS is a survey of Medicare beneficiaries. The data is available to the public and contains information that links the survey and Medicare administrative bill records. According to CMS, the final cohort chosen each year is sufficient to be nationally representative.

[29] It also includes surgical supplies, emergency room visits, ambulance services, mammography screening, urgent care, pap smears, physical therapy, occupational therapy, immunizations, cardiac rehabilitation, therapeutic radiation, mental health, diagnostic/lab tests, x-ray and MRIs, hearing exams, substance abuse, inpatient hospital services, inpatient psychiatric services, skilled nursing, psychiatry, chiropractic services, podiatry, eye exams, hearing, dental, and eye wear.

[30] For additional details on regarding the OOPC variable see Dunn (2010) and the CMS website See "CY 2007 Medicare Options Compare Cohort Selection and Out-of-Pocket Cost Estimates Methodology" available from the CMS website: www.cms.gov.

total expenditure (spending by the insurer plus OOPC) was $2,108.[31] In contrast, for inpatient hospital services only 18 percent of individuals over 65 used inpatient services, but for those that used services the expenditures are high with a mean total expenditure of $18,061. Risk averse enrollees may value medical insurance that covers costly catastrophic events differently than coverage for prescription drugs that tends to have more stable and predictable payments.

Aggregate OOPC estimates for medical services and prescription drugs are constructed by averaging across age and health status categories. For each of these two categories, a single measure of OOPC is estimated by taking a weighted average of the number of individuals in each age and health status category observed in the MCBS file. To correct for the change in methodology in 2007, I normalize the OOPC amount for prescription drugs so that policies with no coverage report OOPC estimates of zero. This is done by subtracting the OOPC for prescription drugs for plans with no drug insurance in that same year. For example, if policy A has drug coverage and a reported OOPC for prescription drugs of $100 and policies with no drug coverage in that year report OOPC of $230, then the reported OOPC amount for policy A is -$130 (=100-230). Therefore, the OOPC for prescription drugs variable is a negative value representing the amount of money saved for an enrollee in that plan relative to the expenditure if the enrollee did not have drug insurance. If a plan does not have drug insurance, then the predicted OOPC for prescription drugs is normalized to $0. This adjustment accounts for the fact that the amount of non-covered drug services for both insured and uninsured individuals shift over time.

Information about plan benefits is obtained from the Medicare Plan Compare database, which provides information on benefit packages for each plan.[32] Benefit information extracted from this database include: the premium, the deductible, the out-of-pocket cost limit (i.e. the maximum an enrollee pays out-of-pocket), whether the plan requires a referral to see a specialist, an indicator for drug insurance, and the size of the physician network. The size of network variable includes a range of the number of "in-network" doctors who typically have lower copays or coinsurance than "out-of-network" doctors. The count of the number of doctors includes primary care physicians and specialists. An example of the type of network range reported in the data is "1501-2000" indicating that the number of doctors covered lies between these values. The number of doctors in a plan is estimated to be the average

[31] www.meps.ahr.gov

[32] The information about each plan is available to the public through the medicare options compare website (http://www.medicare.gov/MPPF).

of this range (e.g. For the range 1501-2000, the size of the network variable equals (1501+2000)/2=1750.5).[33]

The SCP data contains enrollment information by insurer and plan for October of each year.[34] Unfortunately there may be multiple "plans" contained under the same "contract". For instance, there may be two plans that have different benefits and different premiums that have the same contract number, so I cannot determine the number of individuals enrolled in each plan. Although many of the characteristics are often the same (e.g. the plan type (HMO or PPO) and the network size are determined at the contract level); other characteristics are not the same (e.g. the premium and OOPC estimates). To address this issue, I take a similar approach to others in the literature and aggregate plan information to the contract level. To match market shares for a contract to plan characteristics, the plan characteristics are averaged across plans that are listed under the same contract. In addition to using enrollment information, the SCP data also contains information on the number of eligible individuals in each county in each year. A variable indicating the number of plan offerings under the same contract is also constructed, which is an ad hoc variable to control for the value of additional plan variety. In the remainder of this paper, when I refer to the demand and price of the "plan," these are actually the average features of the plans under the same contract.

Table 2 below provides descriptive statistics for the data. It is important to note the substantial variation in the key variables of interest: the premium and the OOPC estimates, which have been shown to have a large impact on consumer surplus (See Dunn (2010)). The principle focus in this article is the effect of the competitive conditions on these strategic variables.

[TABLE 2]

Table A1 in the appendix lists the variables used in this study along with a brief description. See Dunn (2010) for additional details about data used in this article.

6 Results

Demand. This section presents the results from the demand and supply models. The demand estimates are shown in Table 3. The estimates on the key variables of interest are as one would expect; individuals are more likely to purchase plans that have lower premiums, lower OOPC for Drugs, and lower OOPC for Medical Services. Coefficients on the

[33] The number of providers is observed for most plans, but about 6% of the plans appear to be missing the network size variable.

[34] October is one month prior to the open enrollment for the following year. October is chosen because it is after all Open Enrollment periods in which consumers may switch plans (lasting from November 15th to March 31st) and enrollment in October is observed for every year of the data.

premium and OOPC variables are all highly significant. The nesting parameter is positive and precisely estimated, indicating that individuals perceive these plans as distinct from outside option and tend to substitute among MA plans relative to outside alternative. In general, the effect of the premium and OOPC measures on demand are robust to alternative specifications and modeling assumptions. For a more detailed discussion of the demand model and the remaining parameter estimates see Dunn (2010).

[TABLE 3]

Supply. Using the demand estimates, the supply variables of competition may be constructed. Table 4 presents some basic descriptive statistics for these variables. The variable in the first row is the traditional HHI measure of concentration in each market. The HHI measure of competition may be compared with the product concentration measure that is used in the analysis, reported in the second row. These measures have a similar construction, but they are different measures of market concentration, with the average of the product concentration measure 30 percent lower than the HHI measure. Although the variables are distinct, they are positively correlated with a correlation coefficient of 0.66. The next three variables are the measure of rival quality, RU_{jmt}, the insurer's own product quality, δ^*_{jmt}, and the insurer's total quality, δ^*_{Ijt}. Overall, there is considerable variation in these data, which is useful for precisely identifying their effect on the full price of MA products.

[TABLE 4]

Table 5.1 presents the main results from the flexible supply model. The first set of estimates from Table 5.1 includes county fixed effects and state-time fixed effects. The estimates are consistent with insurers behaving competitively. The coefficient on rival utility is negative and highly significant, suggesting that insurers reduce the price of a plan in those markets with higher quality rival offerings. In addition, the product concentration measure is positive and significant, indicating that insurers set higher prices in more concentrated markets. The estimates also show that the insurer's own product quality measures, δ^*_{jmt} and $\delta^*_{I,mt}$, are highly significant and are key determinants of insurer pricing.[35]

[35] Some markets are monopoly markets where the rival product quality is not observed. I estimate the value of rival product quality for monopoly markets by estimating an alternative to Model 1 that includes a dummy variable for whether the market is a monopoly market. The coefficient on the monopoly dummy is -38.1 and highly significant. Next, I set the value of the rival product quality such that, τRU_{jmt} =-38.1. After this adjustment the monopoly dummy is insignificant in all specifications. There are relatively few monopoly markets less than 5% of plan observations in the sample.

Model 2 is the same as Model 1, but includes product fixed effects. The results from Model 2 are qualitatively very similar to those in Model 1, even though the sample size for Model 2 is much smaller because it excludes plans that are in a county for only one year. Similar to Model 1, the effect of both product concentration and rival quality are highly significant and have the expected sign, but the effect of product concentration is larger in magnitude in Model 2. Across the two models, the estimates indicate that competitive effects are quite strong. An approximate measure of the economic importance of concentration and product quality on market price may be seen by looking at the effect of variation in these terms across markets. Using the observed variation in product concentration and product quality from Table 4, a one standard deviation increase in product concentration implies a $7 price increase for Model 1 ($9 price increase for Model 2); but the variation in rival utility has a greater economic effect, with a one standard deviation decrease in rival quality leading to a $37 increase in price for Model 1 ($33 increase for Model 2). Therefore, the product concentration measure accounts for a realtively small fraction of the overall competitive effects.[36] It appears that accounting for the rival product quality is essential for obtaining precise estimates and excluding this measure could lead to a significant underestimate of the effects from competition.

[TABLE 5.1]

In addition to the effects from competition, researchers may also be interested in quantifying economies of scale efficiencies. Model 3 addresses this issue by examining how enrollment affects the full price of insurance. Unlike Models 1 and 2, Model 3 introduces an endogenous variable on the right hand side that is the log of total enrollment in the county for that insurer, $\log(enrollment_{it})$. The IV results from Model 3 show strong evidence of economies of scale in MA insurance markets, as measured by the negative coefficient on log enrollment. As an insurer's enrollment in a county grows, the full price of the insurance product declines. All else equal, a doubling of the enrollment in the county reduces the full price per month by $13.42. It is also worth noting that several other estimates change after accounting for economy of scale effects. Relative to Model 1, the coefficients on each of the two competition variables increase in magnitude.[37] The Model 3 estimates will be used in the policy experiments in the following section because they account for efficiencies from economies of scale, and Models 1 and 2 do not.

Robustness Checks. Each of the three models above suggest strong evidence of competitive effects from both market concentration and the strength of rivals in the market. Several models are estimated to check the robustness

[36] Similarly small competitive effects are found if the HHI concentration measure is used instead of the product concentration measure.

[37] In addition, after capturing scale effects, the coefficient on the insurer's own quality variable, $\delta^*_{I,mt}$, increases in magnitude. It is possible that the insurer quality measure may pick up scale effects prior to controlling for scale effects in the model.

of the above results. First, recall that the left hand side of the regression equations in Models 1, 2 and 3 is constructed from the weighted summation of three variables: premium, expected OOPC for drugs, and expected OOPC for medical services. Although these variables are combined into a single index, one cannot be certain if each of these components is a strategic variable used by insurers. Using the same specification as Model 1 in Table 5.1, Table A5.2 in the appendix analyzes the effects of competition on premium, expected OOPC for drugs, and expected OOPC for medical services, separately. Estimates are consistent with insurers using each of these three variables strategically, showing that insurers offer lower premiums and greater benefits when rival product quality is higher. The product concentration measure is not significant for the OOPC estimates, but the estimates have the predicted positive sign, consistent with more concentration leading to higher prices and lower benefits.[38]

It is also useful to check how the approach applied here differs from the typical reduced form analysis. To demonstrate the difference, I employ the common approach of regressing price on the HHI measure of concentration along with product level fixed effects used to control for endogeneity. Using this framework, I then compare two models. The first model excludes the own product quality measures and in the second model the quality measures are included. Table A5.3 in the appendix shows these results. Both models show the expected positive sign on the product concentration measure, but in the model excluding the quality controls (Model 1 in Table A5.3), the estimated effects of competition are insignificant and lower than in the model that includes the quality controls (Model 1 in Table A5.3).[39] These results indicate the potential for omitted variable bias when researchers do not control for product quality.[40]

[38] When analyzing the different components of full price, the estimates exclude the other strategic variables as controls. For example, when analyzing the effect of competition on premiums, I do not include the OOPC variables. However, it is worth noting that if the remaining components of the full price are included as explanatory variables, the estimates on the effects of competition tend to be greater and more precisely estimated.

[39] These results are representative of the effects observed when one does not control for own product quality. Similar results are also found if the product concentration measure is used instead of the HHI. In addition, using the specifications from Table 5.1 that includes rival product quality, excluding the insurer's own product quality measure shows similarly diminished competitive effects.

[40] The competitive effects measured in Table 5.1 depend on the specification of the demand estimates. To check the sensitivity of the competitive effects to the selected demand estimates, I estimate the supply model using an different set of demand estimates that rely an alternative instrumenting strategy, which is reported in Dunn (2010). I find similar qualitative results using these alternative estimates. In particular, I find that both product concentration and rival product quality are important competitive variables. I also find that own firm product quality is an important control variable across the two estimates. The results indicate a smaller effect of competition, which is likely due to the fact that the value of benefits is predicted to be lower using the alternative demand specification.

The regression results above leave out some of the specific features of the benefit package, such as the out-of-pocket limits. The results

6.1 Structural Cost Estimates

This section completes the estimation of the benchmark structural model by estimating a marginal cost function. The marginal cost of each product is derived from the first order conditions of each insurer assuming Nash-Bertrand pricing. Next, the estimates of marginal cost, mc_{jt}, are regressed on the log of total enrollment in the county for insurer, I, and other factors that could potentially impact marginal cost. Two marginal cost functions are shown. Model 1 estimates include county fixed effects. Model 2 is identical to Model 1, but includes product fixed effects. Both models include state-time dummies to control for unobserved factors that vary over time and impact all insurers across the state. Both Model 1 and Model 2 estimates show a highly negative and significant relationship between enrollment and marginal cost, providing strong evidence of economies of scale. The economies of scale are very similar in magnitude across both models, implying that doubling the number of enrollees in the market leads to a $25 dollar reduction in marginal cost per month.[41]

[TABLE 6]

This evidence of economies of scale in both the structural and reduced form estimates is consistent with the findings of Given (1996) and Wholey et al. (1996) who also find evidence of economies of scale in commercial HMO markets.

7 Market Analysis: A Comparison of Competitive Predictions

To examine the economic benefits of competition in MA markets, the estimates from the previous section are used to measure how consumer surplus changes when there are different ownership structures. Table 7 presents results from several counterfactual experiments. For each experiment, Table 7 reports the impact on consumer surplus relative to the benchmark level that is the total consumer surplus from the MA product offerings across all counties in 2004 and 2007, respectively. The table shows predictions based on the flexible supply model (Model 3) and a structural

do not qualitatively change if these benefit features are included as controls.

[41] The estimates from Table 6 also include some additional notworthy results. As one might expect, as insurers reduce benefits by increasing OOPC, the insurer's marginal cost falls. The results also show that the coefficients on own product quality are positive and highly significant, suggesting that it is costly to supply higher quality insurance products. Moreover, the marginal cost increases rapidly with quality, so that each additional unit of quality is more costly to supply.

To check on the functional form, I also estimated an alternative specification that includes a $\log(Enrollment)^2$ term to allow for greater flexibility. The coefficient on the additional term was small and statistically insignificant.

model assuming Nash-Bertrand pricing.[42] The first experiment sets a common ownership for all insurers in each county, so that there is a single monopolist in each market. Using the flexible model, experiment (1) finds that competition accounts for 54 percent of the consumer surplus produced in the market in 2007 and around 42 percent in 2004. Large effects from competition are also found using the structural model, but the magnitude of the effects are smaller, accounting for 44 percent in 2007 and 38 percent in 2004.[43]

The next counterfactual experiment focuses on merging the two largest insurers in each county, as measured by market share. The magnitude of the loss in consumer surplus ranges between 12 to 17 percent across the two models. Although the reduction in surplus is substantial, the effect on welfare is smaller than the monopoly case, which suggests that in many markets the remaining competitors are an effective competitive constraint. Overall, the consumer surplus predictions from experiments (1) and (2) for both the flexible supply model and the structural model, confirm the importance of competition in MA markets. Moreover, since the estimates from the structural model are near those of the flexible model, they also suggests that Nash-Bertrand pricing may be a reasonable assumption for the pricing behavior of insurers.[44]

In contrast to the first two experiments that look at additional consolidation, the third experiment examines a more competitive market where it is assumed that each product is owned by a different insurer. The consumer surplus effects from splitting product offerings appears to be relatively small with an increase in surplus of between 3 and 11 percent for both the flexible and structural models.

The first three experiments ignored the effects from economies of scale. However, both the flexible supply model and the structural model suggest that the presence of economies of scale may benefit individuals. To measure the importance of scale economies to individuals, experiment (4) sets the minimum of the marginal cost in the market to be equivalent to the scale economies when there are only 1,000 enrollees, which effectively raises the marginal

[42] Since the demand estimates are the same for both the reduced form and structural estimates, the benchmark level of welfare is the same across the two models. To run these simulations on the reduced form model, I simply alter the ownership structure, which affects both the rival product quality and the product quality on the set of products owned by the insurer. Given a predicted price from the reduced form model, the consumer surplus estimates are re-calculated.

[43] If the alternative demand model from Dunn (2010) is used, I find that the aggregate effects of competition from the reduced form model declines relative to those shown in this table, and the magnitude for the total effect is actually closer to the estimates from the structural model (56.0% of total welfare in 2007 and 66.8% in 2004).

[44] The similarities in predictions across these two models may also be seen by looking at price predictions at the product level. The correlation in the predicted price changes from moving to the observed prices to monopoly prices is 0.64 and highly significant across the two models.

cost for many insurance plans. This experiment demonstrates the economy of scale efficiencies are substantial, showing consumer surplus declines between 15 to 25 percent. Although the economy of scale efficiencies are large, they appear to be less important when analyzing the effects of consolidation. Experiments (5), (6), and (7) are identical to experiments (1), (2) and (3), but they consider the effects of economies of scale.[45] In each experiment the results are quite similar to the estimates that ignore scale effects, so it appears that, in practice, the economies of scale have a very small impact on the welfare effects from consolidation. In addition, looking at specific market outcomes from experiment (5), I find that consumer surplus increases in just 0.2 percent of markets using the flexible model and surplus increases in only 0.4 percent of markets using the structural model. The reason for the limited importance of economies of scale when looking at consolidation is that in markets with a large number of enrollees and competitors (where competition is most important), insurers have attained a relatively efficient scale. Therefore, in markets where competition is most important, additional enrollees have a limited impact on cost, but the reduction in competition may have substantial effects on consumer surplus.

[TABLE 7]

Table 7 shows the importance of MA competition in general, but researchers may also be interested in the welfare effects in particular markets. In 2008, United, the largest insurer in the U.S., attempted to acquire Sierra, the largest insurer in the Las Vegas area in both the commercial and MA insurance markets. In the Las Vegas area the insurers accounted for 99 percent of the MA market in 2007 and nearly 100 percent in 2004, so combined they would have a practical monopoly of the market. Although a merger of the commercial insurance business was approved, United agreed to divest the MA component of its business prior to acquisition. Table 8 shows simulations of the potential effects of the proposed merger if it had been consummated. To obtain a range of estimates the table presents results for the years 2004 and 2007.

The predicted loss in consumer surplus from the merger are large based on the estimates from the flexible supply model. Relative to the baseline, these estimates show a reduction in consumer surplus of $98 million in 2007 and $71

[45] For the reduced form results , a new equilibrium must be calculated when scale effects are considered, since changes in prices affect enrollment, and enrollment affect pricing. I solve for the price level and enrollment that satisfy the demand equation and the reduced form supply equation. Equilibria for the structural model are solved for using the first order conditions, but allowing for economy of scale effects to lower costs. Unlike the Models (1) through (3) where costs are assumed to be constant, the Models (5) through (7) use the estimated marginal cost function from Table 6, Model 1, to estimate the change in total cost.

million in 2004 (See line 3). Similarly, large effects are observed using the structural model with losses of \$89 million and \$81 million, respectively. Accounting for scale effects have almost no impact on these results. The estimates show that consumers benefit due to economies of scale (comparing (1) to (2)), but the benefits are relatively small compared to the welfare loss (3). Therefore, if the welfare standard used by antitrust investigators is consumer surplus then it appears that welfare declines by about 40 to 50 percent across all models and years. Even if the welfare standard includes both consumer and producer surplus, then the welfare effects are still large (although considerably smaller) with total welfare falling by \$34 to \$54 million.[46]

[TABLE 8]

Overall, the results in this section confirm that competition in MA markets has a huge impact on consumer surplus. The structural and flexible supply models both imply similarly large welfare effects, but the two models offer distinct predictions. Specifically, the results from the flexible supply model predict changes in welfare due to movements in multiple strategic variables and the predictions are not constrained by supply side theoretical assumptions. Therefore, merger investigators may benefit from a study of both models of competition.

Although competition appears to have a large effect on consumer surplus, policy makers should consider the potential benefit of competition to be limited for a couple of reasons. First, under any competitive scenario, the insurer payments to providers account for a large fraction of overall health care costs, which reduces the potential benefits from competition because insurers must obtain sufficient revenues to cover these costs. A 2005 GAO study reported that the ratio of medical care costs to revenues is 85.7 percent for a large sample of MA plans. Second, private MA plans are paid 12 percent more than what it costs the government to cover similar individuals in traditional Medicare.[47] Therefore, when considering the welfare benefits from competition, policy makers should also consider the additional payments needed to induce private insurers to compete in the market.

[46] Computing producer surplus using the reduced form framework requires some additional assumptions, since there is not a cost function. First, I assume that the pre-merger margin is 10 percent, so that we can capture the lost producer surplus from enrollees leaving the MA market. (A report by the Government Accountability Office found that the ratio of medical expenses to revenues was 85.7 percent in 2005, so the assumption of a 10 percent margin seems plausible.) Second, I assume that the insurer's additional surplus from economies of scale is proportional to the price effect on the consumer. This is calculated by multiplying the total enrollment post-merger by the change in pricing due to economy of scale effects.

[47] See MedPac (2007). Update on Medicare Private Plans. Report to the Congress: Medicare Payment Policy, Chapter 4, March. Also see Dunn (2010) for additional discussion.

8 Conclusion

This article explores competition in the MA program where private insurers compete with traditional Medicare. Competition among MA insurers is analyzed using a flexible supply model that exploits estimates from a structural demand model. The quality measures derived from the demand estimates are shown to be critical for precisely identifying competitive effects.

The results from the analysis show strong and robust evidence of competition among MA insurers. Overall competition accounts for around 40 to 50 percent of the consumer surplus generated in MA markets. This effect is shown by applying the flexible model of competition and is confirmed by a structural model that restricts insurer strategies to Nash-Bertrand pricing. Although the two results are similar, the estimates from the flexible model reveal that competition is occurring along multiple dimensions, including insurers changing both premiums and benefits. In addition, both the flexible and structural models provide evidence of economies of scale, accounting for more than 15 percent of the welfare in the market. Despite finding large efficiency gains from economies of scale, I find that additional consolidation generally leads to large reductions in consumer surplus and that the efficienies from additional consolidation are generally dominated by the consumer surplus loss caused by a reduction in competition.

There are a number of related areas for future research. First, this article shows significant benefits from entry and competition in MA markets, but the analysis does not explain the determinants of entry in these markets. An important area for future research is to analyze the barriers to entry in insurance markets and to determine if an alternative regulatory environment may reduce these barriers. Second, researchers should view the methodology presented here as complementary to the more structural approaches to modeling supply behavior. For instance, researchers analyzing other differentiated product markets may wish to check whether predictions from a flexible supply model match what one predicts using an alternative structural approach.

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9 Appendix

9.1 Demand Estimation Specification

The demand model includes county fixed effects and state-time dummy variables. The county fixed effects account for all factors that affect the mean utility of the outside good that are specific to the a county and invariant over time. For instance, to the extent that average health or income varies across markets and affects the utility of selecting the outside alternative, these fixed effects account for these factors. State-time dummy variables are included to account for changes in demand that vary over time and are common across the state. The state-time dummy variables are especially important in accounting for changes in the outside options, such as Medigap. Medigap plans are typically offered on a statewide basis, so the state-time dummy variables account for changes in the mean utility of the Medigap options. The state-time dummy variables and county fixed effects may also help control for changes in the outside alternative due to the introduction of Medicare Part D drug plan or changes in the Medicaid program.

For estimating the demand model, the sample is limited to those counties with at least 500 eligible beneficiaries and 100 enrollees observed for at least two years of the data. This limited sample is used for two reasons. The county fixed effects included in the model are likely to explain nearly all of the plan shares for smaller counties because there is often only one insurer in smaller counties and no time variation within a county. In addition, the full sample would include a large number of observations from relatively rural counties with little enrollment. The restricted sample contains over 95 percent of MA enrollment.[48] Although the estimates are performed on a restricted sample, the surplus estimates and elasticities reported are based on the full sample.

Two distinct instrument strategies are applied in Dunn (2010) to address the the endogeneity of p_{jmt}, $OOPC\ Drugs_{jmt}$, $OOPC\ Medical_{jmt}$, and $\ln(s_{j|MA})$. One set of instruments exploits the shift in the MA program over these years and uses lagged premiums and OOPC as instruments. This set of instruments relies on a policy change during the period of study that increased the payments to MA insurers. The increase in payments will lead to changes in benefits and premiums in each year, but the lagged value of premiums and benefits will more closely reflect the cost of the individual insurer. The second set of instruments takes advantage of insurance products spanning multiple geographic markets. These instrumenting strategies are discussed in greater detail in Dunn (2010). In this article I will focus on the results that apply lagged premiums and OOPC as instruments, which appears to produce more

[48] The estimation results are similar if I include only counties with all four years of data.

plausible results theoretically with $\beta_1 > \alpha$ and $\beta_2 > \alpha$. To see this, note that if medical expenditures are certain, then one would expect the coefficients on OOPC to be the same as the coefficient on the premium, $\alpha = \beta_1 = \beta_2$. However, risk averse consumers may place a higher value on uncertain medical expenditures, implying that one should expect $\beta_1 > \alpha$ and $\beta_2 > \alpha$. Although the article focuses on results with based on a particular set of demand instruments, the article also notes how the results change when an alternative instrument set is employed.[49]

It should also be noted that consumer heterogeneity in preferences for coverage are not included in this model. However, Dunn (2010) explores adding an additional nest where contracts are grouped into those that offer drug insurance and those that do not, but cannot reject the null hypothesis of a single nest. This suggests that additional heterogeneity may not be important. Although Lustig (2010) allows for consumer heteregeneity over coverage and finds evidence of adverse selection in his model, he does not include a nest for all MA products, which is shown to be highly important in Dunn (2010). It appears that more research is necessary to precisely understand the role of heterogeneity in this market.

10 Tables

[49] One reason for exploring an alternative instrument set is that the OOPC estimates are not precisely the amount an individual might expect to pay. In addition, the model presented here does not formally address issues of adverse selection. It is more realistic to view the OOPC variables as indexes used to approximate an expected OOPC amount, so it is possible that $\beta_1 < \alpha$ or $\beta_2 < \alpha$. For example, the OOPC variables are constructed assuming health care consumption is fixed, but one might find $\beta_1 < \alpha$ or $\beta_2 < \alpha$ if consumers are able to shift medical expenses as OOPC increase. This may be an issue for prescription drugs where splitting pills or shifting to less costly generics can reduce OOPC.

Table 1. Average Market Characteristic By Number of Competitors

Number of Competitors	Total Enrollment	Eligible	MA Rate	Premium	Avg. OOPC Drugs	Avg. OOPC Medical	Tot. OOPC	Number of Mkts
1	1,371.2	17,796.4	\$666.51	\$59.14	-\$33.54	\$80.89	\$106.50	1,113
2	7,500.0	38,373.9	\$700.20	\$51.07	-\$41.40	\$82.76	\$92.43	716
3	12,242.2	53,962.9	\$720.46	\$48.63	-\$44.85	\$84.06	\$87.84	429
4	11,207.2	47,078.2	\$725.32	\$44.28	-\$46.54	\$84.81	\$82.56	220
5	27,010.3	90,829.2	\$758.18	\$37.70	-\$49.72	\$80.03	\$68.01	111
6	11,287.0	51,518.0	\$723.12	\$33.77	-\$46.27	\$89.07	\$76.56	22
7	5,624.6	40,073.5	\$743.07	\$43.04	-\$47.30	\$99.51	\$95.26	5

Table 2. Summary Statistics of Contract Characteristics*

	Mean	sd	25th percentile	Median	75 percentile
Key Plan Variables					
Expected OOPC Medical Services	$87.26	$30.69	$69.78	$84.21	$106.25
Expected OOPC Drugs	-$44.26	$33.04	-$77.60	-$47.52	-$8.97
Premium	$49.38	$56.14	$10.00	$40.00	$72.23
Network size (in 1,000 of doctors)**	4.48	5.20	0.75	2.50	5.25
Plan Types					
Referral Required	0.19				
PPO	0.15				
Regional PPO	0.08				
Local FFS	0.56				
Other Plan Characteristics					
Has Drug Insurance	0.76				
Has a Deductible	0.11				
Amount of Deductible	$45.51	$219.47			
Has an OOPC Limit	0.66				
Amount of OOPC Limit	$2,343.63	$2,271.78			
Contract Age in County	1.41	1.74			
Insurer Age in County	1.69	1.90			
# offerings	2.45	1.46			

*Estimates reported in 2007 dollars.

**Average only includes network based plans that are not missing the network variable.

Table 3. Demand Estimates

	Model 1	
	coef	t
Premium	-0.0054	(-4.25)
Expected OOPC Drugs	-0.0103	(-3.09)
Expected OOPC Medical Services	-0.0180	(-3.86)
Log(Share_j | MA product)	0.6839	(8.06)
Req. Referral * Log(Network Size)	-0.0362	(-0.77)
Log(Network Size)	0.1122	(2.77)
Req. Referral	0.0389	(0.56)
Private FFS	0.2709	(2.09)
PPO	-0.2384	(-2.36)
Regional PPO	-0.0620	(-0.44)
Has a Deductible	-0.0440	(-0.49)
Amount of Deductible	-0.0002	(-2.06)
Has an OOPC Limit	0.1976	(1.74)
Amount of OOPC Limit	0.0000	(-0.26)
# offerings	0.0207	(0.8)
Log(Plan Age in County)	0.6108	(3.5)
Log(Insurer Age in County)	0.0702	(1.01)
Log(Plan Age) * Log(Insurer Age)	-0.1857	(-3.11)
Plan in Market in 2001	0.1572	(1.4)
Insurer in Market in 2001	0.2740	(2.99)
Missing Network Variable	0.1834	(1.41)
Instrument for Premium	Yes	
Instrument for OOPC	Yes	
County Fixed Effects	Yes	
Plan Fixed Effects	No	
State-Time Fixed Effects	Yes	
Adjusted R-Squared (Within)	0.830	
# of Observations	11,991	

Table 4. Description of Competition and Unobserved Utility Variables

Variable	Mean	s.d.	p25	p50	p75
Herfindahl	0.487	0.223	0.313	0.446	0.606
Product Concentration	0.344	0.223	0.190	0.269	0.410
Rival Quality	0.535	1.391	-0.091	0.641	1.285
Product Quality	-1.274	1.056	-1.893	-1.283	-0.661
Insurer Quality	-0.974	1.179	-1.664	-0.997	-0.275

Table 5.1 Main Results for the Flexible Supply Model - Effect on Full Price

	Model 1		Model 2		Model 3	
	Coef.	t	Coef.	t	Coef.	t
Product Concentration	33.24	(2.21)	42.93	(2.54)	47.70	(3.05)
Rival Quality	-27.43	(-12.34)	-23.61	(-9.8)	-29.97	(-11.32)
Insurer Quality	16.92	(3.1)	-1.66	(-0.26)	37.03	(3.59)
Insurer Quality^2	2.86	(2.72)	8.90	(2.39)	1.90	(1.61)
Insurer Quality^3	-0.33	(-1.84)	1.23	(1.28)	-0.56	(-2.84)
Product Quality	104.12	(12.41)	148.68	(13.81)	101.35	(11.86)
Product Quality^2	6.15	(4.77)	1.95	(0.55)	5.95	(4.65)
Product Quality^3	-0.26	(-1.12)	-2.44	(-2.6)	-0.19	(-0.81)
Referral*log(Network Size)	-2.94	(-0.59)	-1.59	(-0.23)	-3.66	(-0.73)
Log(Network Size)	-0.46	(-0.12)	3.50	(0.47)	1.48	(0.37)
Referral	-38.32	(-4.8)			-28.65	(-3.12)
PFFS	47.30	(2.88)			39.83	(2.4)
PPO	-4.20	(-0.47)			-4.23	(-0.47)
Reg	5.13	(0.42)			4.91	(0.4)
Log(plan age)	-49.67	(-3.52)	-70.86	(-5.32)	-37.73	(-2.47)
Log(insurer age)	9.12	(1.16)	-2.34	(-0.1)	18.07	(2.11)
Log(plan age)*log(insurer age)	-3.71	(-0.54)	-6.17	(-0.41)	-5.80	(-0.84)
Plan in market in 2001	22.10	(1.57)			12.78	(0.85)
Insurer in market in 2001	-5.26	(-0.52)			0.51	(0.05)
Missing network variable	27.92	(2.56)	-3.13	(-0.19)	22.08	(2.06)
log(Enrollment)					-19.39	(-2.28)
County Fixed Effects	Yes		Yes		Yes	
Plan Fixed Effexts	No		Yes		No	
State-time fixed effects	Yes		Yes		Yes	
Adj R-squared	0.77		0.95		0.77	
Number of Obervations	11,991		6,600		11,991	

Table 6. Marginal Cost Estimates

	Model 1		Model 2	
	Coef.	t	Coef.	t
log(Enrollment)	-28.133	(-13.34)	-29.704	(-8.41)
Expected OOPC Medical Services	-1.0128	(-9.04)	-0.4358	(-2.83)
Expected OOPC Drugs	-0.7256	(-9.62)	-0.5514	(-5.38)
Product Quality	59.49	(8.21)	38.77	(4.92)
Product Quality^2	3.97	(6.56)	2.10	(2.95)
Product Quality^3	0.17	(1.2)	0.35	(2.2)
Referral*log(Network Size)	-10.32	(-3.27)	-9.24	(-1.71)
Log(Network Size)	8.96	(3.71)	6.37	(1.24)
Referral	-13.66	(-2.73)		
PFFS	-3.36	(-0.66)		
PPO	2.99	(0.54)		
Reg	-2.58	(-0.24)		
Log(plan age)	-11.21	(-1.72)	1.09	(0.08)
Log(insurer age)	27.74	(5.52)	-2.69	(-0.19)
Log(plan age)*log(insurer age)	-12.32	(-3.47)	-30.39	(-2.75)
Plan in market in 2001	0.78	(0.1)		
Insurer in market in 2001	12.01	(1.53)		
Missing network variable	39.21	(3.21)	2.10	(0.15)
County Fixed Effects	Yes		Yes	
Plan Fixed Effexts	No		Yes	
State-time fixed effects	Yes		Yes	
Adj R-squared	0.68		0.75	
Number of Obervations	11,991		6,600	

Table 7. Consumer Surplus Estimates from Competition

	Flexible Supply Model				Structural Nash-Bertrand Premium			
	2007		2004		2007		2004	
Benchmark Consumer Surplus (In Billions)	$20.95	100.0%	$13.16	100.0%	$20.95	100.0%	$13.16	100.0%
1. Monopoly	$9.68	46.2%	$7.61	57.8%	$11.71	55.9%	$8.17	62.0%
2. Merging the Two Largest Competitors	$18.22	87.0%	$10.95	83.1%	$18.55	88.5%	$11.06	84.0%
3. Single Product Ownership	$23.16	110.6%	$13.68	103.9%	$21.49	102.6%	$13.57	103.1%
With Economy of Scale Effects								
4. Setting Maximum Enrollment to 1,000	$17.89	85.4%	$10.63	80.7%	$17.27	82.5%	$10.03	76.2%
5. Monopoly With Scale Effects	$10.15	48.5%	$7.93	60.2%	$12.71	60.7%	$8.53	64.8%
6. Merging the Two Largest Competitors With Scale Effects	$18.81	89.8%	$11.27	85.6%	$19.41	92.6%	$11.43	86.8%
7. Single Product Ownership With Scale Effects	$23.11	110.3%	$13.67	103.8%	$20.96	100.1%	$13.39	101.7%

Table 8. United-Sierra Proposed Merger (Figures In Millions)

	Flexible Supply Model				Structural Nash-Bertrand Premium			
	2007		2004		2007		2004	
Benchmark Consumer Surplus (In Millions)	$204.97	100.0%	$184.59	100.0%	$204.97	100.0%	$184.59	100.0%
1. Merger	$104.67	51.1%	$111.55	60.4%	$112.48	54.9%	$102.54	55.5%
2. Merger with Scale Effects	$106.64	52.0%	$113.90	61.7%	$116.04	56.6%	$103.93	56.3%
3. Loss in Consumer Suprlus From Merger (Benchmark - (2))	$98.33		$70.69		$88.93		$80.66	
4. Producer Surplus Gain From Merger	$43.19		$37.11		$35.37		$30.46	
5. Producer Surplus Gain with Scale Effects	$47.93		$41.62		$49.24		$40.63	
6. Net Loss From Merger (5) - (3)	**$50.39**		**$33.58**		**$53.56**		**$50.20**	

10.1 Variables & Appendix Tables

Table A1. Description of Variables

Premium	The MA premium on the contract above the part B premium.
Expected OOPC Drugs	The CMS estimated OOPC for prescription drug services only. Negative dollar value that is the amount of OOPC relative to no drug insurance.
Expected OOPC Medical Services	The CMS estimated OOPC for medical services (i.e. All services excluding prescription drugs).
Has Drug Insurance	An indicator that is one if drug insurance is offered and zero otherwise.
Network Size (1,000s)	The estimated number of doctors "in-network" for a contract reported in thousands.
Log(Network Size)	Log of network size in thousands=Log(Network Size).
Missing Network Variable	An indicator that is one if the network size is missing and zero otherwise.
Req. Referral	An indicator that is one if a referral is required to see a specialist and zero otherwise.
Private FFS	An indicator that is one if the contract is a Private FFS plan and zero otherwise.
PPO	An indicator that is one if the contract is a PPO and zero otherwise.
Regional PPO	An indicator that is one if the contract is a Regional PPO and zero otherwise.
Has a Deductible	An indicator that is one if the contract has a deductible and zero otherwise.
Amount of Deductible	The amount of the deductible.
Has an OOPC Limit	An idicator that is one if the contract has a spending limit where all services above the specified limit are covered and zero otherwise.
Amount of OOPC Limit	The amount of the OOPC limit.
# offerings	# of plan offerings listed under the specified contract.
Contract Age in County	The age of the contract in the county starting in 2001.
Insurer Age in County	The age of the insurer in the county starting in 2001.
Contract in Market in 2001	An indicator that is one if contract was present in the county in 2001 and zero otherwise.
Insurer in Market in 2001	An indicator that is one if the insurer was in the county in 2001 and zero otherwise.
MA Rate	Rate paid to insurers (Benchmark Rate in 2007).

Table A5.2 Results By Strategic Variable

	Premium		OOPC Drugs		OOPC Medical	
	Coef.	t	Coef.	t	Coef.	t
Product Concentration	13.31	(1.92)	3.22	(0.64)	4.13	(1.23)
Rival Quality	-3.39	(-1.87)	-3.62	(-3.03)	-5.14	(-7.73)
Insurer Quality	0.56	(0.13)	0.14	(0.04)	4.83	(2.26)
Insurer Quality^2	-0.41	(-0.39)	0.66	(1.04)	0.60	(1.24)
Insurer Quality^3	-0.03	(-0.21)	-0.16	(-1.29)	0.00	(0.02)
Product Quality	10.06	(1.54)	17.42	(5.68)	18.23	(7.2)
Product Quality^2	3.51	(2.81)	-1.13	(-1.9)	1.44	(2.71)
Product Quality^3	0.53	(2.99)	-0.08	(-0.8)	-0.19	(-2.49)
Referral*log(Network Size)	-10.52	(-3.24)	-0.27	(-0.17)	2.43	(1.56)
Log(Network Size)	11.67	(4.68)	-3.28	(-3.21)	-1.76	(-1.57)
Referral	-2.18	(-0.4)	-9.59	(-2.66)	-5.34	(-2.37)
PFFS	-9.92	(-1.31)	-3.29	(-0.29)	19.04	(4.42)
PPO	-2.64	(-0.41)	-6.06	(-1.61)	3.01	(1.05)
Reg	-3.02	(-0.32)	-5.37	(-1.26)	5.52	(1.41)
Log(plan age)	-2.41	(-0.36)	-21.12	(-2.47)	-2.07	(-0.55)
Log(insurer age)	-6.22	(-1.39)	-1.53	(-0.33)	5.48	(2.52)
Log(plan age)*log(insurer age)	-1.22	(-0.29)	-0.12	(-0.03)	-0.67	(-0.52)
Plan in market in 2001	-7.98	(-1.37)	16.96	(2.68)	-0.69	(-0.19)
Insurer in market in 2001	25.59	(4.4)	4.02	(0.8)	-11.55	(-3.64)
Missing network variable	65.95	(4.13)	16.41	(1.76)	-20.81	(-4.05)
County Fixed Effects	Yes		Yes		Yes	
Plan Fixed Effexts	No		No		No	
State-time fixed effects	Yes		Yes		Yes	
Adj R-squared	0.46		0.41		0.66	
Number of Obervations	11,991		11,991		11,991	

Table A5.3 Competition Results with HHI Index

	Model 1		Model 2	
	Coef.	t	Coef.	t
HHI competition measure	26.58	(0.96)	38.71	(2.15)
Insurer Quality			0.33	(0.05)
Insurer Quality^2			12.63	(3.18)
Insurer Quality^3			2.10	(2.08)
Product Quality			145.62	(12.47)
Product Quality^2			0.29	(0.07)
Product Quality^3			-3.22	(-3.31)
Referral*log(Network Size)	-25.31	(-0.96)	-2.48	(-0.33)
Log(Network Size)	31.32	(1.29)	5.08	(0.64)
Log(plan age)	9.68	(0.38)	-62.33	(-4.12)
Log(insurer age)	-5.53	(-0.22)	-3.71	(-0.14)
Log(plan age)*log(insurer age)	-26.66	(-1.35)	-9.43	(-0.57)
Missing network variable	52.03	(1.53)	3.36	(0.18)
County Fixed Effects	Yes		Yes	
Plan Fixed Effexts	Yes		Yes	
State-time fixed effects	Yes		Yes	
Adj R-squared	0.72		0.94	
Number of Obervations	6,600		6,600	